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PHOTOGRAPHY AND HISTORY. THE PHOTOGRAPHIC CAMERA COLLECTION OF THE NATIONAL MUSEUM OF TRANSYLVANIAN HISTORY (THE NINETEENTH CENTURY - THE EARLY TWENTIETH CENTURY)

Abstract: The discovery of photography involved two fundamental conditions: the achievement of an optical device of the "camera obscura" type, which would allow the formation of clear images, and the discovery of a manner that would enable their stable fixation on a support, with the help of specific chemical procedures. The two conditions were met as a result of the efforts undertaken by the Frenchmen Nicéphore Niépce and Louis Jacques Daguerre; the end result was the emergence of the daguerreotype in 1839. The following section highlights the progress made in this area in the second half of the nineteenth century, which was primarily aimed at decreasing the exposure time by increasing the sensitivity of the photosensitive materials used, as well as the luminousness of the lenses used in the dark-room. The technical development of cameras has been primarily related to the improvement of the photosensitive substrate and to the ever more complex optical systems designed in order to obtain photographic images. Thus, the paper highlights the main types of lenses with which photographic cameras were equipped, ranging from simple biconvex lenses to exceptional photographic lenses, with which, through optical and mathematical calculations, astigmatism aberration was corrected and which are still used nowadays (the Tessar). Given the fact that the museum holds, in its patrimony, a studio photographic camera from the end of the nineteenth century and over 1.500 glass photographic plate negatives, the paper also presents the main stages followed in obtaining a photo through such a device one century ago. Through photographing and developing, a photographer would obtain, at first, a glass plate negative and then, he would use a wooden frame in which he would overlay the glass plate negative and the photo paper, which he exposed to light for a well-determined time interval. The positive copy (the actual photograph) was attained in the laboratory through a series of specific developing, fixing, washing and drying operations.

Keywords: Nicéphore Niépce, daguerreotype, photographic camera, glass plate cliché, studio shooting

The birth of reproduced images

In principle, the discovery of photography involved two fundamental conditions. On the one hand, this involved the achievement of an optical device of the "camera obscura" type, which would allow the formation of a clear image, and on the other, the invention of ways to enable the stable fixation of this image on a support, with the help of various chemical procedures. Regarding the first condition, it should be noted that in 1504, Leonardo da Vinci described a camera obscura with a small orifice drilled in a thin metal plate. This allowed the image of the objects to become visible, by way of transparency, on a very thin sheet of white paper placed close to the orifice. After more than half a century, Giambattista della Porta (1535-1615) and Cardinal Daniele Barbaro (1514-1570) described and practically built such a camera, considered to be the ancestor of classic photographic cameras.

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Light is an essential element in producing a photograph; etymologically, photography means "writing with light" and it was thus referred to for the first time by the astronomer John Herschell (1839).[2] The silver salts' properties of changing their colour under the impact of light were already known, and throughout the eighteenth century, various methods employing these substances were indeed used by the scientists; however, they obtained merely ephemeral images because the method of fixing them was not well established.

The real discoverer of photography was the Frenchman Nicéphore Niépce, who resorted to the camera obscura to achieve stable images in time, using a photosensitive material. Instead of the translucent screen of the camera, he placed a photosensitive layer made of a hydrocarbon, called Bitumen of Judea, which hardened under the impact of light. This was applied on a silvered copper plate and, after exposing it to light for about 8 hours, followed by washing it with oil and lavender essence, he managed to create the first photo in the world (1826). Nicéphore Niépce continuously perfected this process, especially after 1829, when he became associated with the artist and decorator Louis Jacques Daguerre, the inventor of the diorama.[3]

The official date for the invention of photography is considered, however, to have been the year 1839, when the daguerreotype[4] - basically Daguerre's improvement of Niépce's invention (who had died in 1833) - was presented at the Paris Academy of Sciences. The procedure patented and made public by the physicist François Arago came next: a silvered copper plate was subjected to the action of iodine vapours in the dark. Silver iodide, which is very sensitive to light, was thereby formed. The plate was impressed in the darkroom for a few minutes. Then it was subjected to the action of the mercury vapours that developed the plate. Fixation was achieved with sodium chloride.[5] The end result was a unique photographic image (somewhat similar to an image seen in a mirror) because this procedure did not allow its transfer onto another photosensitive medium, as would be the case with negatives later.

The invention of the negative

In parallel with these results, in England, William Fox Talbot developed the so-called "calotype" process (1838), which involved using a negative on a paper support with silver iodide, which, after being impressed in the darkroom, developed and fixed, could be reproduced in positive format on albumen-coated light-sensitive paper, through exposure to light and various complicated chemical processes.[6] While in the beginning

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[2] ***, *Larousse: Dictionar Inventatori şi invenţii*, Bucharest, Ed. Tehnică, 2001, p. 414.

[3] *Ibidem*, p. 315.

[4] On 19 August 1839, the manner of obtaining a daguerreotype was publicly presented after the Chamber of Deputies had passed a law in June, under which the French state was to ensure a life annuity of 6.000 francs to Daguerre and, respectively, of 4.000 francs to the descendants of Nicéphore Niépce, in exchange for this invention. Georges Potonniée, *Histoirire de la découverte de la photographie*, Paris, Publication photographiques Paul Montel, 1925, pp. 180-184.

[5] Paul Agarici, Gheorghe Băluţă, "Redescoperirea imaginii," in *Almanah Tehnium*, 1988, p. 183.

[6] Fox Talbot was the first man to illustrate a book with the aid of photography in 1844. Georges Potonniée, *op. cit*., pp. 201-205.

this process was used less than the daguerreotype, over time it proved its feasibility because by starting from a single negative, several photographs could be obtained and the process was less expensive due to the fact that paper was cheaper and easier to use compared with the silvered copper plates needed to produce a daguerreotype.

From this point on, the production of an image entailed the combination of two fundamental processes: the negative process, whose result was the transformation of the latent image obtained through photographing, in the darkroom, an apparently negative image (cliché-verre), and the positive process, whereby a positive copy of the photographed subject was obtained after an existing negative cliché. The positive image (the actual picture) could be obtained through copying on light-sensitive paper, the so-called contact copy, which was had the same dimensions as the existing negative or was enlarged through projection, arriving at superior dimensions compared to those of the negative. As we shall see below, in the period, copying from a glass plate negative onto photographic paper was accomplished by using a special device of the copy frame type; only when the size of the negative formats was decreased did there appear the need for enhancing devices, which used the oil lamp, the oxyhydric flame and, then, the incandescent light bulb as a light source.

The second half of the nineteenth century registered great progress in the field of photography, which primarily entailed reducing the exposure time by increasing the sensitivity of photosensitive materials and the brightness of the objectives used in the camera obscura. In this regard, in 1847, Claude Abel Niépce de Saint-Victor, the nephew of the inventor of photography, introduced the glass plate support for photographic emulsions and created, through a series of chemical processes, the albumen-coated glass plate negative.[7]

The next stage in increasing the sensitivity of glass negatives was the use of collodion (cellulose dissolved in a mixture of ether and alcohol) as a substrate for the silver salts to be applied on a glass plate. In the wet process, pictures had to be taken immediately after the application of the photosensitive emulsion on the plate and their development was to take place within a few minutes, while in the process using dry collodion (1861), the emulsion could be stored for up to one month, but its sensitivity was several times lower.

The qualitative climax of glass negatives was reached in 1871, when Richard Maddox perfected the dry plate process, which used a stable emulsion of silver bromide and gelatin as a photosensitive layer. A few years later, Charles Bennett discovered a new preparation method by which the emulsion became ten times more sensitive, reducing the exposure time to 1/25 sec. and making it possible for photos to be taken without a tripod. After 1879, the process quickly spread as glass plates were manufactured and marketed in standard formats, allowing the development of photographic techniques.[8] Thus, glass was the first material used as support for negative

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[7] *Ibidem*, p. 251. His two works that laid the grounds for the new procedure were: Claude Abel Niépce de Saint-Victor, *Recherches photographique. Photographie sur verre. Héliochromie. Gravure héliographique*, Paris, Alexis Gaudin et Frères, 1855, and, respectively, *Traité practique de gravure heliographique sur acier et sur verre*, Paris, Librairie de Victor Mason, 1856.

[8] André Gunthert, *La conquête de l'instantantané. Archéologie de l'imaginaire photographique en France (1841-1895)*, *Thèse de doctorat*, Paris, Ecole des Hautes Etudes en Sciences Sociales, 1999, pp. 230-231.

photosensitive materials and had the advantage that it maintained the photosensitive emulsion perfectly flat regardless of the format size. However, this support also had a number of drawbacks: it was heavy, brittle, it occupied a large space and was uncomfortable to use, especially when it came to transporting it. Therefore, in the last two decades of the nineteenth century, research focused on the discovery of another support for emulsions. In these years, the progress of chemistry led to the discovery of the supple celluloid support, which was manufactured in 1889. In the same year, Thomas Alva Edison invented the 35-mm wide film, which would later become the standard format both in film making and in photography.

The one who revolutionised the technique of photography, however, was George Eastman, the founder of Kodak Company, who invented the flexible negative (roll film) on paper and then on celluloid support (1888). The system he established for shipping the device to the company for developing, reloading with film and sending it back to the recipient, along with the developed photos, soon made photographs accessible to all, given also the appearance of cheaper cameras, their easy use and simplified procedures for developing and fixing images.

In Europe, photography achieved great public success in the inter-war period, with the appearance of the Leica photo camera (1925), which used a 35 mm negative film with a cliché of 24x36 mm. This format has, to this day, been the standard used in photographic practice, both by amateurs and by professionals. The use of the negative-positive process for reproducing photographed images has underlain classical photography for over a century and a half, but is about to be completely replaced, given the advent of today's digital photography.

Photographic cameras

Any classical photo camera, from the simplest to the most sophisticated, was basically a camera obscura equipped with a photosensitive medium (emulsion photographic plates, sheet films, negative films, etc.), which was meant to produce a latent image of the photographed object. An important element in the classification of devices at the end of the nineteenth century and the beginning of the twentieth was the picture format. Thus, depending on the standard size of the negative used, cameras could have a large, medium or small format.[9] In general, studio cameras (Figure no. 1) allowed, by their very design, the use of several photographic plate formats (6x9, 9x12, 12x15, 13x18, 18x24 cm), while medium or small portable devices used only one standard negative type.

Light was guided onto the surface of the substrate with a lens (or group of lenses) that formed the objective and the amount of light entering the device was controlled by variations in the diameter of the hole (aperture) or the shutter mechanism, which controlled the exposure time. In the first cameras, the shutter was simply a cap covering the lens, and the photographer would take it out during shooting, while empirically calculating the exposure time according to the aperture and the sensitivity of the negative used.

[9] ***, *Dictionnaire mondial de la photographie des origins à nos jours*, Paris, Larousee/VUEF, 2001, p. 35.

The selection of the image to be captured was done through the viewfinder, which could have its own lenses (indirect targeting) or could be optically adapted to the objective (direct targeting). A special feature that was characteristic of period devices with bellows[10] was represented by the formation of the image on the frosted glass behind it; the clarity of the image was regulated with the help of the rack or by moving the objective lens. For greater ease in perfecting the image, the photographers of the time would cover their heads with a dark cloth or pouch, which obstructed light and allowed them to obtain a clear picture on the frosted glass, identical to that which was to be recorded on the photographic plate.

While the technical evolution of photo cameras was primarily related to improvements of the photosensitive support, it is no less true that the optical systems designed to obtain photographic images also evolved over time, starting from the simple biconvex lens. In the mid-eighteenth century, the English optician John Dollond created the achromatic lens for the camera obscura, the first objective where spherical and chromatic aberrations were corrected. In 1812, William Wollaston improved the lenses used in the camera by resorting to a meniscus lens.

The great importance of the optical system in producing good pictures was realised by the French optician Charles Chevalier, who considered that the objective was the "soul of the device." He collaborated both with Nicéphore Niépce and with Daguerre, producing the achromatic objective with two lenses for the latter. In 1840, Chevalier built and marketed *Le Photographe*, a complete device consisting of both the camera obscura and the necessary accessories for developing ten daguerreotypes prepared for exposure. The entire system weighed 14 kg and was sold at a high price, being regarded as a type of portable device at the time.[11] In the same year, the first major achievement in the field of optical systems with which camerae obscurae were equipped was the objective built by the Hungarian optician Joseph Petzwal, later manufactured by the German Voightländer, as the first well-calculated objective that was not built by empirical methods. Of a hemispherical type, its objective was composed of four lenses and had a luminousness that was twenty times higher than the previously used lenses, but was marred by astigmatism aberration. Notwithstanding all this, brightness was a very important factor because it greatly reduced the shooting time: for this reason, the Petzwal objective was, for a long time, preferred for shooting portraits.

Just as frequently used at the time was the flat lens, also known as the rectilinear lens, built by John Dallmeyer in 1866, after laborious mathematical calculations, based on the theories of optical aberrations set forth by the German mathematician Philipp Ludwig von Seidel.

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[10] The first camera that utilised bellows to facilitate the adjustment of images was used by Nicéphore Niépce between 1822 and 1825. See *Larousse: Dicţionar Inventatori şi invenţii*, p. 415.

[11] Georges Potonniée, *op. cit*., p. 223. Chevalier extensively popularised the new process, being among the first to sell these camerae obscurae, which were highly appreciated at that time, in batches. In addition to his devices, other camerae obscurae that appeared during this period were those produced by the Giroux and Susse Frèrés companies and they sold very well, especially in France. Charles Chevalier, *Nouvelles instructions sur l'usage du daguerréotype. Description d'un nouveau photographe et d'un appareil très simple destine à la reproduction des épreuves au moyen de la galvanoplastie*, Paris, Chez l'Auteur, 1841, *passim*.

Otto Schott's discovery of optical glass that possessed enhanced properties, such as light flint or high-density crown glass (1886), opened the way for producing new objectives, with which astigmatism aberration could be corrected; this is why they were called anastigmatic lenses. Some of these objectives were symmetrical: the Protar lens, calculated by Dr. Paul Rudolph and built by Carl Zeiss in 1890, then the Dagor lens (an abbreviation for Doppel-Anstigmat GOeRz), calculated by Emil von Hoegh and built by the Goerz Company in 1892 and the Planar lens, patented in 1896.

In parallel, asymmetrical anastigmatic objectives were developed. A remarkable achievement in this regard was the Cooke triplet (1893), calculated by Dennis Taylor, followed by the Heliar lenses (1900), calculated by Carl Harting for the German company Voightländer, and, last but not least, the Tessar, calculated by Paul Rudolph and patented by the Zeiss Company in 1902 - one of the most famous objectives that have remained in use until today. Basically, most of the later objectives with normal focal distances had their origin in the hemispherical planar (the most luminous) or in the triplet. They were used to equip the dozens of small and medium size camera models that appeared in the first decades of the twentieth century, of which we shall mention a few: Kodak, H. Ernemann, Leica Series I-III, ICA, Canon, Agfa, Contax, Minox, Pentax, Voightländer, Exakta, Gomz (Lomo), etc. In 1889, Thomas Alva Edison invented the 35 mm wide film with sprocket holes, which would later become the standard format (24x36 mm) both in films and in photographs, especially after the appearance of the famous Leica I camera, designed by Oskar Barnack and sold from 1925 on.

Across the ocean, an important milestone in the evolution of photo cameras was the year 1888, when George Eastman launched the first Kodak Brownie camera. It used a flexible negative, initially supplied in paper and then in celluloid reels, which allowed the images to be stored in the device and to be subsequently developed by the same company. Gradually, the cumbersome plate cameras began to be more and more successfully replaced by new small and medium format models, which used roll film as the photosensitive medium. These were primarily cheaper and easier to use - essential qualities that greatly simplified photographic techniques, making photography accessible to all.

Stereophotography

In the mid-nineteenth century, stereoscopy was discovered: it added the third dimension to photography - depth. The prospect of simultaneously recording two adjoining images with two camerae obscurae considerably enhanced interest in images in relief. The possibility of seeing drawn objects in relief had been demonstrated by the physicist Charles Weatstone in 1838, by creating a two-mirror stereoscope; two years later, the device with two lenses appeared - a version that is still produced today.

In principle, in order to obtain a stereoscopic cliché it was necessary that the photo camera should have two objectives. When the camera had only one lens, the photographer used an optical device called a stereoscopic adapter with mirrors. This was mounted in front of the unique objective of the camera and projected onto the cliché-verre two images of the photographed subject situated at a distance of 6.5-7 cm. The distance between the pairs of stereoscopic images corresponded to the pupil distance of the human eyes and the

relief effect was achieved with the help of a stereoscope (the most popular being the one built by Oliver Wendell Holmes in 1881), an instrument that enabled the left image to be perceived by the left eye and the right image by the right eye.

In 1891, Louis Ducon du Hauron presented a new way of obtaining relief images by using anaglyph images.[12] In their case, the left and right images were coloured, one in red and one in cyan blue, being then superimposed on the same positive. To achieve the relief effect, they were looked at through a pair of special glasses with a red filter (for the left eye), which obstructed the cyan coloured image, and, respectively, with a cyan filter (for the right eye), which blocked the image coloured in red.

The main steps towards obtaining a photograph in a photo studio one century ago

Assuming that the studio was equipped with a professional camera identical to that found in the museum collection (Figure no. 1), obtaining a photo entailed going through several main stages, as follows: the photographer decided, in advance, with the client, the setting, type and format of the photo, then arranged the lights, the stereoscopic adapter (in case the intention was to obtain a stereophotograph), opened the shutter and set the image clarity with the help of the rack, which activated the bellows, or by moving the objective lenses. After the so-called clarity plan was achieved, the inverted image of the photographed subject was initially formed on the frosted glass at the back of the device (Figure no. 2).

Next, the photographer closed the shutter and fixed at the back of the camera the closed box containing the glass photographic negative (Figure no. 3), then lifted the device that protected the photosensitive medium and opened the shutter, determining the exposure time of the photographic plate. In that period, the exposure time could consist of several seconds or even minutes in a weaker light, being determined by the shooting conditions, the type and quality of the photosensitive material used, and last but not least by the quality of the photo camera. During this interval, the customer had to stand still, which is why the photo studio had suitable furniture that made this possible.

After the shooting proper, the photographer closed the negative box, which contained a latent image of the subject now and prepared developing and retouching the glass plate negative. These operations were done under special light conditions, in the laboratory, where, after a series of chemical processes using special reagents, the negative was developed and the result was the so-called glass cliché-verre (Figure no. 4).

In order to obtain a positive copy, the negative thus obtained was placed in contact with the albumen-coated photosensitive paper in a special device of the copy frame type (Figure no. 5). The frame was then exposed to light for a time that was precisely determined after carrying out a few initial tests. The glass plate negative was removed and the exposed photographic paper was further processed through a series of developing, fixing, washing and drying operations,[13] the end result being the actual

[12] *Larousse: Dicţionar Inventatori şi invenţii*, p. 415.
[13] Valentin Ţepordei, *Laboratorul fotoamatorului. Materiale fotosensibile alb-negru şi prelucrarea lor*, Bucharest, Ed. Tehnică, 1969, pp. 110-117.

picture, which had the same size as the glass plate negative used - in this case, two 6.5x9.5 cm images (Figure no. 6).

Next, the photo was pasted onto a cardboard support, on which the photo studio's address was printed, for advertising purposes, and was delivered to the customer. In the case of stereoscopic images, the stereoscope was necessary for viewing these (Figure no. 7). The pair of images was placed into its metal slot, sharpness was adjusted by moving the wooden rod and the viewer would look simultaneously through the two lenses in order for the relief effect to be achieved.

The museum's collection of modern history has 1.538 glass cliché-verres of various formats that were in use in the last three decades of the nineteenth century. Using various types of photosensitive emulsions as a support, they were donated, at the start of the twentieth century, by the photographer Ferenc Veress, a trail blazer in the field of photography in Transylvania. More than a decade after the daguerreotype had been patented in France, he had the merit of opening, in Cluj, the first photographic cabinet in Transylvania (1852), afterwards remaining in touch with all the photographic techniques that appeared in the second half of the nineteenth century.[14]

Focusing on subjects like the personalities of Cluj, but also on buildings, structures or landscapes, the negatives of the Cluj-based photographer represent exceptional period documents both from an artistic point of view and as inspiration sources for historians, architects, engineers, landscape architects, etc. From among the characters that remained still before the lenses of Veress' device, we should mention aristocrats from the noble Hungarian families (Banffy, Josika, Kemeny, Teleki, Wesselenyi, etc.), but also teachers, doctors, lawyers and other notables of the city, or sheer unknown characters, men, women or children.[15]

In time, the emulsion layer of these negatives has undergone various types of degradation, and in order to save the images, most of them have been photographed and processed, positive copies being then achieved with the help of digital technology. Currently, some of the processed negatives and some cameras from the museum's collection can be seen at: http://www.mnit.ro/fotografii-de-epoca.

The images and technical specifications of the photographic cameras from the end of the nineteenth century and the first decades of the twentieth century, which are included in the museum's collection, can be found below. Several photo accessories are also presented, assisting us in better understanding the manner of obtaining photographs more than one century ago.

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[14] On the techniques he was familiar with and applied in practice, see Melinda Mitu, "Fotoceramică în colecţiile de artă decorativă ale Muzeului Naţional de Istorie a Transilvaniei," in *Acta Musei Napocensis*, Historica, 45-46, 2008-2009, p. 210.

[15] We have created a series of photographs on the subject of family and children after the cliché-verres made by Veress and have included them in the catalogue *Copiii şi copilăria în fotografia secolului al XIX-lea,* Bucharest, Ed. Total Publishing, 2004, pp. 26-27.

List of illustrations

Figure no. 1. Professional camera for a photographic studio
- RA Goldmann brand - Vienna
- photosensitive support - photographic plate, maximum format 30x30 cm
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- dating - 1890
- Inv. No. M 7643

Figure no. 2. The ground glass frame of the camera
- it is here that, with the help of the lens, the upside down image of the photographed subject is formed

Figure no. 3. Glass plate negative storage box
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Figure no. 4. Cliché-verre - a mother and her daughter
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- Inv. No. C 10187

Fig.1

Fig.2

Fig.3

Fig.4

Fig.5

Fig.6

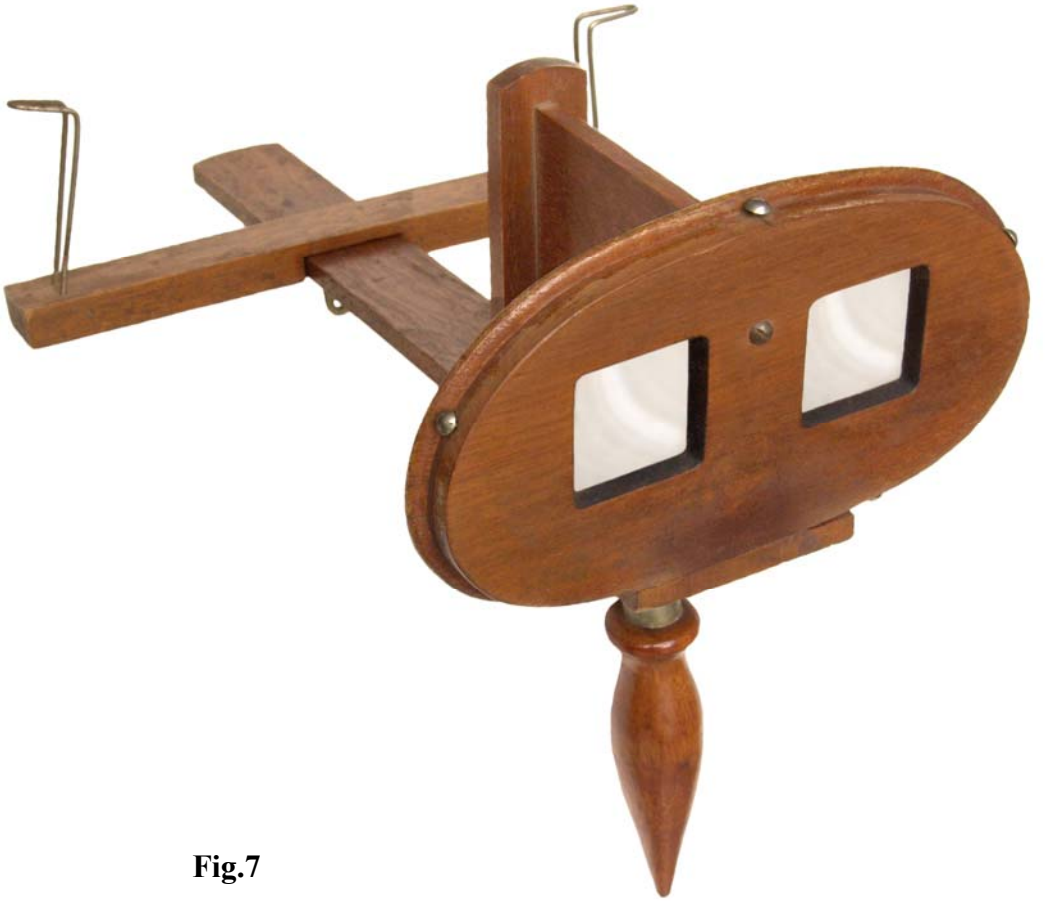

Fig.7

Fig.8

Fig.9

Fig.10